Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554



| | |
|---|---|
| **In the Matter of** | |
| **Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services** | **CC Docket No. 92-297** |



# JOINT COMMENTS OF
# MOTOROLA SATELLITE COMMUNICATIONS, INC. AND IRIDIUM, INC.

Michael D Kennedy,
Vice President and Director
Regulatory Relations
Barry Lambergman, Manager
Satellite Regulatory Affairs
**Motorola, Inc.**
1350 I Street, N.W.
Washington, D.C. 20005
(202) 371-6900

Philip Malet
Pantelis Michalopoulos
Colleen Sechrest
**Steptoe & Johnson**
1330 Connecticut Ave., N.W.
Washington, D.C. 20036
(202) 429-3000

Its Attorneys

James G. Ennis, Director
Patricia A. Mahoney, Senior Manager
Licensing Affairs
F. Thomas Tuttle, Deputy General Counsel
**Iridium, Inc.**
1401 H Street, N.W.
Washington, D.C. 20005
(202) 326-5795

Dated: September 7, 1995

## SUMMARY

Motorola Satellite Communications, Inc. and Iridium, Inc. (collectively "Motorola") hereby submit their joint comments in response to the Notice of Proposed Rulemaking ("NPRM") released July 28, 1995 in the above-captioned proceeding. The Commission has achieved a difficult and complex balance among proponents of diverse services, both satellite and terrestrial, each promising significant public benefits. The NPRM accommodates all of those services in the available Ka-band spectrum.

Motorola's interest in the Ka-band is two-fold. First, the use of the band is vital for the feeder links of the IRIDIUM® system. Feeder links between gateways and satellites are an indispensable component of the IRIDIUM® system, whose first satellites will be ready for launch in mid-1996. Accommodating these feeder links is necessary to remove the major contingency of Motorola's license and to allow the timely operation of the first global non-GSO MSS satellite system. Motorola notes that, of the various proposed uses of the Ka-band, the feeder links needed for the IRIDIUM® system will most likely be the first to arise in time. Motorola commends the Commission for its dispatch in trying to bring this proceeding to closure and thereby enable Motorola and other Ka-band interests to initiate service to the public expeditiously.

Second, while Motorola naturally agrees with the Commission that FSS spectrum used for MSS feeder links should be excluded from competitive bidding, it has a broader concern regarding auctions. As the licensee of a global MSS system now engaged in the process of trying to obtain licenses to operate the IRIDIUM® system all around the world, Motorola is deeply concerned about the potential negative impact of the Commission's proposal to auction spectrum for global FSS systems on its efforts to gain access to foreign markets.

Motorola also supports the band segmentation plan and most of the sharing rules proposed by the Commission in its NPRM. Indeed, it is precisely because the NPRM involves a delicate balance among many diverse interests that any significant departures from the proposed rules might seriously disturb that balance. Accordingly, the Commission should resist major changes to its proposed rules, and the changes proposed by Motorola herein are in the nature of fine-tuning, clarifying the proposed sharing rules and proposing certain additional restrictions where necessary. The most significant additional restriction deemed crucial by Motorola involves sharing between MSS feeder links and geostationary systems, which would be impossible unless the GSO FSS systems are restricted to using only a limited number of large terminals (rather than omnipresent Very Small Aperture Terminals ("VSATs")) at a suitable distance from MSS feeder link stations in the shared part of the spectrum. This should be a feasible, not excessively burdensome constraint on GSO FSS systems since VSATs would still be allowed to operate in all of the primary GSO FSS spectrum with the sole exception of the co-primary 29.25-29.5 GHz sub-band.

With respect to sharing between LMDS and MSS feeder links, the Commission should accord appropriate weight to the agreement between Motorola and the major LMDS proponents, which settled some of the most difficult-to-reconcile differences between satellite and terrestrial providers in this proceeding. This agreement is predicated on a series of mutual compromises that could be upset by selective revisions of crucial parts of the agreement Consistent with its policy of favoring total or partial settlements, the Commission should respect this agreement in its entirety, and should refrain from such selective revisions. In particular, the Commission should dismiss a proposal by an LMDS signatory to the agreement to abandon the agreed-upon restrictions on LMDS subscriber-to-hub links.

With respect to licensing rules for non-geostationary Ka-band systems, Motorola urges the Commission to avoid auctions which could make it uneconomic to

construct and operate truly global systems, and to avoid mutual exclusivity by adopting stringent technical and financial qualifications. With respect to geostationary FSS systems, orbital separation in the relatively virgin arc for the Ka-band would likely prevent the emergence of a mutually exclusive situation and obviate any consideration of auctions.

Table of Contents

**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, D.C. 20554**

| | |
|---|---|
| **In the Matter of** | |
| **Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services** | **CC Docket No. 92-297** |

## JOINT COMMENTS OF MOTOROLA SATELLITE COMMUNICATIONS, INC. AND IRIDIUM, INC.

Motorola Satellite Communications, Inc. and Iridium, Inc.[1/] hereby submit their joint comments in response to the Notice of Proposed Rulemaking ("NPRM") released July 28, 1995 in the above-captioned proceeding. Motorola applauds the Commission for achieving a difficult and complex balance among proponents of diverse services, both satellite and terrestrial, each promising significant public benefits. The NPRM accommodates all of these services in the finite Ka-band spectrum. Accordingly, Motorola supports the band segmentation plan and most of the sharing rules proposed by the Commission. Indeed, Motorola cautions that, precisely because the NPRM reflects a delicate balance among many diverse interests, any significant departures from the proposed rules might irreparably disturb that balance. The Commission should therefore resist such temptations. The changes proposed by

---

1/ In this pleading, Motorola Satellite Communications, Inc. and Iridium, Inc. will be collectively referred to as "Motorola."

Motorola herein are in the nature of fine-tuning, clarifying the proposed sharing rules and proposing certain additional restrictions where necessary.

Motorola's interest in the Ka-band is two-fold. First, the use of the band is vital for the feeder links of the IRIDIUM® system.[2/] Feeder links between gateways and satellites are an indispensable component of the IRIDIUM® system,[3/] whose first satellites will be ready for launch in mid-1996. Accommodating these feeder links is necessary to remove the major contingency of Motorola's license and to allow the timely operation of the first global non-GSO MSS satellite system. Motorola notes that, of the various proposed uses of the Ka-band, the feeder links needed for the IRIDIUM® system most likely will be the first to arise in time Motorola commends the Commission for its dispatch in trying to bring this proceeding to closure.

Second, as the licensee of a global MSS system now engaged in the process of trying to obtain licenses to operate the IRIDIUM® system all around the world, Motorola is deeply concerned about the potential negative impact of the Commission's proposal to auction spectrum for global FSS systems on its efforts to gain access to foreign markets.

## I. BAND SEGMENTATION PLAN AND SHARING RULES

### A. As Proposed, the Commission Should Adopt the Prohibition on LMDS Subscriber-To-Hub Links in the Shared Feeder Link/LMDS Spectrum

Motorola strongly supports the Commission's proposal to adopt the prohibition on subscriber-to-hub LMDS links in the shared MSS feeder link/LMDS spectrum (29.1-29.25 GHz), as it is an important part of the agreement between

---

2/ In Re Application of Motorola Satellite Communications, Inc. for Authority to Construct, Launch and Operate a Low Earth Orbit Satellite System in the 1616-1626.5 MHz Band, 10 FCC Rcd. 2268 (1995).

3/ For this reason, Motorola, of course, agrees with the Commission that FSS spectrum used for MSS feeder links should be excluded from competitive bidding.

Motorola and the LMDS interests.[4] Failure by the Commission to adopt this proposed rule, which was agreed to by, among others, Motorola, CellularVision and Texas Instruments in the LMDS/FSS 28 GHz negotiated rulemaking, would seriously compromise the feeder link operations of the IRIDIUM® system.

### 1. The Commission's Proposal Is Consistent With Its Policy of Favoring Total or Partial Settlement Agreements

The NRMC Agreement between Motorola and the LMDS proponents should carry substantial weight in crafting sharing rules consistent with the Commission's policy of favoring private settlements, particularly where they are, as here, multi-party agreements resolving complex and contentious questions. Such settlements serve the public interest by reducing the time, cost and uncertainty of protracted proceedings.[5]

The Commission's policy of favoring settlement extends to partial as well as to full settlements.[6] In its alternative dispute resolution proceeding, the

---

[4] See Views of the NRMC Members Supporting Motorola-Suite 12/CVNY Rule Proposal in the Form of Their Version of Section VI To Report of Working Group 2 (September 23, 1994) ("NRMC Agreement" or "Motorola-LMDS Agreement"). These views were subscribed to, among others, by Motorola, Suite 12/CVNY, GHz Equipment Company, Bell Atlantic, Texas Instruments and a number of public interest parties.

[5] See In Re Rebecca Radio of Marco, 4 FCC Rcd. 830 (1989); RKO General, Inc., 3 FCC Rcd. at ¶ 12 (1988)); Spanish International Communications Corp., 2 FCC Rcd 3336, 3340 (1987); ASD Answer Service, Inc., 1 FCC Rcd. 753, 754 (1986); Mid-Atlantic Cable Service v. Home Team Sports and Columbia Cable of Virginia, 9 FCC Rcd. 3991, 3993 (1994); In Re Application of American Radio-Telephone Service, Inc., 93 FCC 2d 1138, 1143 (1983).

[6] See In the Matter of Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Non-Voice, Non-Geostationary Mobile Satellite service, 8 FCC Rcd. 8450 (1993) ("[The] parties willingness to participate in the Commission's initial negotiated rulemaking process, to expend the considerable effort required to effect reasonable compromises when necessary, has greatly assisted Commission staff and has streamlined this rulemaking process."). See also In Re Application of American Radio-Telephone Service, Inc., 93 FCC 2d at 1143 ("[p]artial settlement serves the public interest because it reduces the number of parties in a proceeding, simplifies the issues, and presents for Commission consideration an improved . . . offering").

Commission has reconfirmed that the Commission will make every effort possible to resolve disputes through, among other means of dispute resolution, settlement negotiation.[7/] While the negotiated rulemaking committee established by the Commission failed to reach consensus, the partial agreement reached by many of the committee members remains an especially valuable contribution to the Commission's rulemaking endeavor and should be given great weight by the Commission.[8/]

The Motorola-LMDS Agreement reflects a delicate quid pro quo struck by the settling parties. Partial revision of crucial provisions could disturb a carefully constructed edifice of compromises and undermine the very essence of the Commission's policy in favor of private settlements -- that, being acceptable to all settling parties, they obviate conflict and save the expense and delay of adversarial proceedings.[9/] The Commission should be especially careful not to engage in such revisions where, as here, they are requested by one of the parties that agreed to the settlement in the first place -- Texas Instruments.

The prohibition on LMDS subscriber-to-hub traffic is critical to the Motorola-LMDS Agreement. Motorola sought and obtained the agreement of the LMDS interests based on sound technical and practical concerns (see below) and in exchange for reciprocal concessions made by Motorola. The restriction on LMDS subscriber-to-hub traffic is necessary for the unimpeded operation of the IRIDIUM® system feeder links.

---

7/ In the Matter of Use of Alternative Dispute Resolution Procedures in Commission Proceedings and Proceedings in which the Commission is a Party, 6 FCC Rcd. 5669, 5616 (1991)("ADR Procedures").

8/ The Negotiated Rulemaking Act recognized this value by providing that, in the absence of a consensus, the Committee may nonetheless transmit to the agency a report, and members of the Committee may include addenda, to assist the rulemaking process. See 5 U.S.C. § 566(f).

9/ See ADR Procedures, 6 FCC Rcd. at 5616.

### 2. None of the Methods Suggested for Accommodating LMDS Subscriber Traffic is Supported by Empirical Evidence and Policing Compliance with Such Methods Would Be Impracticable

The fundamental interference problem associated with subscriber-to-hub LMDS transmissions arises from a fundamental difference between those transmissions and the LMDS hub-to-subscriber links: the subscriber antennas tend to point upwards towards the hub (and thus towards the satellites), whereas the hub antennas tend to point downwards and are thus less likely to cause harmful interference into the satellites. In light of these extremely serious sharing problems, Motorola submits that the ban on LMDS subscriber links in the 29.1-29.25 GHz band is a crucial provision of the NRMC Agreement between Motorola and the LMDS proponents. It would be difficult to fashion a lesser restriction that would allow subscriber traffic in that portion of the spectrum and protect Motorola at the same time, because, among other things, it is difficult to analyze precisely the effects of multiple subscriber links on the satellites.[10/] In the course of the negotiated rulemaking, the LMDS proponents provided subscriber link proposals that were incomplete and largely inconsistent with one another -- a natural consequence of the fact that each company proposes a different system aimed at effectuating a different business plan. Of course, the eventual emergence of dozens of LMDS licensees will likely spawn even greater diversity and technical variation

---

[10/] Working Group 1 of the NRMC studied subscriber transmissions and their effect on one NGSO-FSS and two GSO satellite receiver systems but not on the feeder links of the IRIDIUM® system. Working Group 2 studied the effect of hub-to-subscriber, but not subscriber-to-hub, LMDS traffic on one NGSO MSS system's feeder links. Even though Texas Instruments belatedly submitted a paper on subscriber traffic, the analysis was based on assumptions to which Motorola and others in the group could not agree. As an example, the assumption that "CPE antenna coupling is limited to pencil beam interaction," see NRMC 46 "LMDS and FSS-MSS Systems Interference and Co-Share Techniques in the 28 GHz Band," ignores the aggregate interference power of the off axis main lobe, spurs, and side lobes. An inadequate accounting for all of the sources and modes of interference coupling can significantly influence the results of analysis. Texas Instruments' assertion in a subsequent letter that "analysis showed that the CPEs as an aggregate will not cause harmful interference to MSS feeder link operations" is similarly based on the improper assumptions underlying the earlier paper.

among their systems. In light of this lack of uniformity and predictability and associated technical difficulties, agreement was reached between Motorola, CellularVision and Texas Instruments that subscriber transceivers should not be permitted to transmit in the shared LMDS/MSS feeder link band.

Additionally, Appendix 1 hereto demonstrates that increasing the IRIDIUM® system's minimum elevation angle from 5 to 7 or 8 degrees would compromise the link acquisition process for the IRIDIUM® system and would be ineffectual in avoiding harmful interference into the satellites. While such an increase in elevation angle would result in a very minor (10-15%) decrease in the area where low angle intercepts occur, this minor decrease would tend to be offset by a corresponding slight increase in the size of the footprint resulting from a higher elevation angle. The net effect is that an increase of the IRIDIUM® minimum elevation angle would not reduce the interference potential into the IRIDIUM® system.

Even if sharing were somehow possible through compliance with any of the suggested mitigating methods, the practical impossibility of policing compliance with those methods throughout the country would make the interference risk to the IRIDIUM® feeder links intolerable. Motorola would effectively be compelled to rely on compliance with such a method by each of possibly hundreds of LMDS operators and millions of consumers throughout the country. In the event such mitigating techniques are not properly implemented by one or more licensees, it would be virtually impossible to identify the source of interference into the IRIDIUM® system so as to promptly effect a cure. In light of such an intolerable risk, the restriction on subscriber traffic in the 29.1-29.25 MHz band is required by elementary principles of spectrum management.

### 3. The Prohibition on LMDS Return Links Should Apply Regardless of the LMDS Licensing Scheme Adopted by the Commission

The NPRM has suggested several LMDS licensing schemes, including proposals where one LMDS license per market would comprise just the 150 MHz of co-primary LMDS spectrum at 29.1-29.25 GHz. Motorola takes no position on such matters, but merely points out that the proposed ban on LMDS subscriber-to-hub traffic should apply regardless of the licensing scheme ultimately chosen by the Commission. In the event the Commission were to issue 150 MHz licenses, the restriction would naturally encumber all of the spectrum encompassed within those licenses, which would effectively mean that the 150 MHz LMDS licensees would be confined to multi-channel distribution programming. Since prospective bidders would know of this prohibition in advance of an auction, they would be able to take it into account in estimating the value of these licenses. In fact, these licenses might appeal to bidders only interested in distribution programming, creating a product that more closely fits their plans and sparing them the need to bid for spectrum which allows services they do not want to provide. Likewise, the potentially lower value of those licenses compared to the 27.5-28.35 GHz spectrum might entail lower prices to consumers, appealing to those consumers that are only interested in receiving programming and would rather not pay for a service that they do not need.

The Commission has requested comment on how the band sharing plan would be affected if, as proposed, the Commission adopts BTAs rather than MSA/RSAs for licensing LMDS systems.[11/] The use of BTAs should make no difference for the purpose of Motorola's choosing locations of feeder link primacy (proposed rule § 21.1002). The primary rights of MSS feeder links will simply be confined to the 75 nautical mile circle around the coordinates identified by Motorola subject to the MSA-based constraints of § 21.1002(c)(2). If this circle is totally encompassed within

11/ NPRM ¶ 60.

one BTA, these primary rights will not extend to the rest of the BTA. If this circle includes parts of more than one BTA, the primary rights will similarly be confined to those parts. In each case, prospective bidders will be aware of Motorola's choices and the attendant limitations in certain specified BTAs prior to the commencement of auctions and will be able accurately to gauge the implications on the value of the license before bidding takes place. The only exception is § 21.1002(c)(3), which only applies for points located at least 75 nautical miles outside the border of the 100 largest MSAs and will have a similar effect on LMDS licensees regardless of whether the Commission uses BTAs for licensing.

In fact, Motorola supports use of BTAs for LMDS licensing because it is compatible with proposed rules § § 21.1020 and 21 1021. Both of these rules impose limits on the aggregate LMDS transmissions within a BTA. In a BTA licensing environment, each licensee would have control over the hub transmissions in one BTA and would be able to ensure compliance with these limits. If the Commission were to use MSA/RSAs, compliance with the limits of § § 21.1020 and 21.1021 would require coordination of more than one licensee and might be difficult to enforce, as the limits could end up being imposed on the aggregate transmissions straddling parts, but not all, of more than one licensing area.[12/] The proposed use of BTAs would avoid this problem.[13/]

---

12/ Compare the footnotes to Tables 1 and 2 at proposed §§ 21.1020 and 21.1021, which Motorola naturally supports.

13/ Coordination of more than one licensee for the purpose of compliance with these limits would be needed only for the New York BTA, where two licensees might build stations. In any case, if the Commission adopts the proposed licensing scheme for the New York BTA, it should expressly require the two New York licensees to coordinate their operations for purposes of complying with § § 21.020 and 21.021.

## B. The Proposed MSS Feeder Link Allocation, as well as the Mechanism for Identifying Eight Feeder Link Complexes in the 29.1-29.25 GHz Band, Can Only Accommodate One MSS System

### 1. Motorola Cannot Support the Addition of a Second System in the 29.1-29.3 MHz Band.

The 150 MHz of shared MSS feeder uplink/LMDS spectrum and corresponding shared MSS feeder downlink/FS spectrum is already less than the spectrum requested by Motorola. There is substantial doubt whether this limited amount of spectrum could accommodate on a co-frequency basis the day-to-day operations of more than one MSS system. While the CPM Report expresses the view that, with respect to intra-service inter-system sharing between non-GSO feeder links, the criteria for avoiding interference "would be met in the majority of cases without recourse to amelioration techniques," CPM Report at ¶ 3.4.1, this view is contingent on several important assumptions. Indeed, the original source input to the studies made apparent that the view expressed in the CPM Report was based on an effort to model the very complex in-line interference events between the IRIDIUM® system and TRW's Odyssey® systems. These studies assumed the existence of large separation distances -- 440 Kilometers in latitude and another 440 Kilometers in longitude -- between feeder link earth stations of the two systems. Further, the interference criteria referenced in the study (set forth at Table 8b of § 3 1.2) were originally developed for the 4-8 GHz band and are not necessarily appropriate for the 20-30 GHz bands. In fact, the MSS community has not agreed upon a short-term interference criterion for feeder link Ka-band operations, and TRW has not proposed such a criterion. It is also not clear how these studies modeled traffic between pairs of Odyssey® satellites, as the Odyssey® system is designed to use satellite diversity on its feeder links as well as on its service links. In light of these assumptions and uncertainties, as well as the extreme complexity of the in-line interference events between the two systems, it appears that existing CPM studies cannot create the level of certainty necessary to accept

co-frequency sharing of the feeder links of the IRIDIUM® system with the feeder links of another system.

Thus, while Motorola supports the accommodation of two MSS systems in 400 MHz of feeder link spectrum (which is possible subject to a restriction on the use of VSATs by FSS systems in the 29.25-29.5 MHz band, as discussed below), it cannot support the addition of a second system in the 29.1-29.3 MHz band. As noted in the NRMC Agreement with respect to proposed § 21 1002:

> ***An important assumption underlying this rule is that Motorola would be the only non-GSO MSS operator licensed to use the 29.1-29.3 GHz band.*** Motorola is of the view that it will not be possible for the IRIDIUM® System to share feeder link spectrum on a co-frequency basis with other non-GSO MSS systems.[14/]

### 2. The Motorola/LMDS Agreement Takes Account of the Feeder Link and Gateway Location Needs of Only One MSS System

The Agreement between Motorola and the LMDS interests contemplates the feeder link and gateway location needs of only one MSS system -- the IRIDIUM® system. Accommodating one more MSS system would require providing for additional earth station complexes beyond the eight locations contemplated by the NRMC Agreement and proposed by § 21.1002(c)(2). Motorola expects to construct as many as six gateway and satellite control stations in the United States. In light of this requirement, the sharing Agreement between Motorola and the LMDS proponents provides for the selection of eight protected feeder link earth station complex sites by Motorola prior to the licensing of LMDS stations As explained in the NRMC Agreement, the basis for eight choices was the need for flexibility. Motorola will not know with certainty prior to the LMDS auctions which six MSAs might include a gateway; this choice depends on several operational and marketing factors that may

14/ Views of NRMC Members Supporting Motorola-Suite 12/CVNY rule Proposal in the Form of Their Version of Section VI to Report of Working Group 2, NRMC/84 (Rev. 1) at 5 (emphasis supplied).

not have become sufficiently clear by that time. Failure to take into account some of those factors could compromise the operational and marketing effectiveness of the IRIDIUM® system. By allowing it to select eight sites, the NRMC Agreement provides Motorola with some margin of error in naming these sites. If the number of sites Motorola is permitted to select were reduced in order to accommodate another Big LEO system operator, Motorola would lose this critical flexibility, making sharing with LMDS untenable.

### C. The Commission Should Restrict FSS Operations in the Shared MSS Feeder Link/FSS Spectrum to a Limited Number of Large Terminals and Should Ban FSS Operations in the Locations to Be Identified by Motorola, Including All Potential SCS Locations

With respect to the spectrum proposed to be shared between MSS feeder links and geostationary FSS systems (29.25-29.50 GHz), Motorola submits that co-frequency, co-geographic sharing between the two types of services is not possible if unrestricted numbers of FSS terminals, including VSATs, are allowed to operate in this shared spectrum. The absence of such a restriction on the type, number and location of FSS terminals would create a very complex environment of transmissions from omnipresent FSS interfering sources to multiple geostationary orbital locations. Coordination of the MSS feeder link operations with such transmissions would be impossible.[15/] As explained in Technical Appendix II attached hereto, successful coordination by use of mitigation techniques, including geographic separation and power control, can be achieved only if FSS operations in the shared spectrum are restricted to a limited number of large terminals located a substantial distance outside

---

15/ This conclusion is based on simulations presented by Hughes to IAC using the proposed characteristics of the Spaceway and IRIDIUM® systems, as well as studies submitted to CPM-95 by Canada (CPM95/25) using the characteristics of Canadian GSO VSAT and Odyssey; it is confirmed by simulations recently completed by Motorola as detailed in Appendix 2

the affected feeder link locations,[16] including at the very least the sites to be identified for satellite control stations. Such mitigation techniques simply are not compatible with the use of VSATs.

In addition to the 150 MHz of shared spectrum with LMDS, Motorola will need only the lower 50 MHz of the 29.25-29.5 GHz band. However, Motorola supports the allocation to Big LEO MSS feeder links of 400 MHz, which can accommodate an additional MSS system, but which necessitates extending the restriction on FSS systems to the entire 29.25-29.5 GHz band. The presence of VSATs would effectively

---

[16] Appendix 2 examines a number of mitigation techniques that might be considered during coordination. The Appendix first addresses the problem of permissible levels of short term interference from the perspective of the IRIDIUM® system. The proposed NonGSO criterion is: 1 less than or equal to .79Nt for .01% of time on an annual basis cumulative considering both the up and down link and from all interfering systems. Since the NPRM is suggesting than the IRIDIUM® feeder links share with LMDS and GSOs on the uplink and FS and GSOs on the downlink, it is not yet possible to recommend a budget for "single entry" interference from a single GSO network. If the arc was to have a GSO spaced every 2 degrees then a single entry budget might be .0002% for each GSO. The Appendix then examines a number of mitigation techniques and concludes that the following three would be of some value particularly when used in combination:

size of earth terminal antenna

geographic separation

adaptive power control

The power control strategies to compensate for the severe rain attenuation of various systems was the most critical parameter for successful combination. The IRIDIUM® system adaptively adjusts its up and down links powers to compensate for range and atmospheric attenuation. This complies with Sec. 25.204(d), which requires earth stations above 10 GHz to transmit only the up link power necessary to achieve "desired signal quality." The downlink pfd is limited by 25.208(c) which sets levels to protect Fixed Service stations and consequently allows GSO networks to carry large constant down link margins. In the United States, it might be possible to use power control as a mitigation technique between a few terminals and a few orbital slots particularly if in combination with geographic separation. Internationally, however, there is no constraint on uplink power. Since the technical constraints in the U.S. regulations do not coincide with ITU-R regulations, Motorola supports the view that the FCC should support modifying international regulations such that successful coordination is more feasible around the world

prevent the operations of one Big LEO system outside the 29.1-29.25 GHz band, and would completely thwart any prospect of accommodating two Big LEO systems in 400 MHz of feeder link spectrum.

The restriction of FSS operations to large terminals in the 250 MHz of co-primary spectrum (29.25-29.50 MHz) will not be an excessive burden on geostationary systems, since their operations will remain unrestricted in 750 MHz of spectrum (28.35-28.60 and 29.5-30.0 GHz) where under the Commission's proposal they would enjoy an exclusive primary FSS allocation. A sufficient number of omnipresent FSS terminals could reasonably be accommodated in that spectrum.

Even if the foregoing restrictions are adopted, Motorola notes that the proposed mitigation techniques would still be unavailing without, at a minimum, compliance by the GSO FSS operators with the power limits imposed by the Commission's rules at 47 C.F.R. § 25.204(d). The Commission should specifically confirm that this rule applies to GSO FSS operations in the Ka-band. At the same time, no similar rule exists internationally, potentially making sharing between GSO FSS and MSS feeder links impossible outside the United States even if the restrictions on size and type of FSS terminals are adopted

Unrestricted use of omnipresent VSATs across the entire GSO FSS allocation would also create insurmountable problems not only for MSS feeder links in the shared uplink bands, but also for the terrestrial Fixed Service, with which GSO FSS must operate on a co-primary basis, in the downlink band. These downlink problems further militate in favor of banning the use of VSATs not only in the shared MSS feeder link portion of the FSS uplink band but also in the companion portion of the FSS downlink band, leaving some leeway for terrestrial FS operators in that portion of the band.[17/]

---

[17/] It is also recommended that the FCC adopt Appendix 28 as modified by

(continued ...)

Subject to the foregoing constraints, Motorola supports coordination on a "first-come-first-served" basis, as suggested by the Commission. See NPRM ¶ 64. In elaborating on "first-come-first-served," the Commission correctly notes that "eight feeder link complex locations in the 28 GHz band will be identified before any competitive procedures begin," and that these complexes "are likely to specify 50 MHz of spectrum at 29.25-29.30 GHz." Id. The Commission should reconfirm that the identification of those eight locations establishes the MSS operator's primacy under the first-come-first-served criterion. As explained in the NRMC Agreement, while Motorola will be able to identify prior to the LMDS auctions eight MSAs within which it may locate feeder link stations, it will not be able to provide earth station-specific coordinates at that time owing to uncertainty as to whether one of those sites will in fact be used as a future gateway site, or owing to unknown variables such as site acquisition and zoning. Again, as noted above, the purpose of selecting eight sites is to provide Motorola with some measure of flexibility in siting future gateway stations, since most of these stations will not be installed until after LMDS systems are deployed. Accordingly, the coordination rule between GSO/FSS and MSS feederlink stations would similarly need to protect these eight sites for Motorola vis-a-vis GSOs because GSO systems may well be deployed before some of these MSS gateway stations. The flexibility that Motorola needs and that the Motorola-LMDS Agreement ensures would be

17/ (... continued)
Recommendations IS 847 and IS 849 for frequencies up to 29.5 GHz that are shared by FS and FSS. It is quite difficult to evaluate sharing with GSOs without considering coordination restrictions imposed by the FS on the feeder downlinks of the IRIDIUM® system. Section 25.252 does not provide permissible levels of interference into FSS or FS above 14.5 GHz and it is difficult to recommend GSO/feeder link sharing criteria without knowing feeder link/FS sharing criteria

substantially forfeited if Motorola did not have a primacy right over GSO FSS station at those eight sites.[18/]

### D. Motorola Supports Either of the "Unconventional" Pairing Downlink Arrangements Proposed for FSS Systems

#### 1. "Conventional" Pairing Arrangements Are Not Necessitated by Technical or Operational Considerations

The Commission requests comment on the "unconventional" downlink pairing arrangements proposed for GSO FSS systems. The Commission recognizes the need to support multiple services in a limited amount of spectrum, and seeks comment on proposals that depart from the traditional 9.8 GHz pairing.

In the past, space systems required equal amounts of spectrum for uplinks and downlinks. However, with the advent of digital communications and the use of spot beams, on-board-processing satellites and inter-satellite links, the requirements for balanced up and down links are no longer necessary. The technical and operational considerations that previously may have required balanced and equally spaced frequency bands no longer exist.

In fact, there are examples of unconventional pairings and reverse band operation within the Region 2 allocations of the Radio Regulations for the proposed bands. The FSS is allocated for uplink transmissions from 17.7 to 18.4 GHz in a primarily FSS downlink band. The Broadcast Satellite Service ("BSS") is likewise allocated feederlinks from 17.3 to 17.8 GHz without a comparable band in the 27 GHz region, and the Earth exploration-satellite service is allocated 200 MHz from 18.6 to 18.8 GHz and 1.5 GHz from 28.5 to 30.0 GHz.

This technical reality is consistent with the position of the United States in international fora. The U.S. has repeatedly opposed recommendations for mandatory

---

[18/] In addition, even though Motorola will initially need only two SCS stations, it needs protection from GSOs for all eight locations to be identified to accommodate future growth, which may require the deployment of additional SCS stations.

"conventional" pairing -- particularly in ITU-R Working Party 4A, on the ground that such required pairings might inhibit efficient use of the geostationary orbit.

### 2. The Downlink Pairing for the IRIDIUM® System Was Necessitated by Sound Operational Considerations, Including International Coordination of the System

Motorola notes again that its choice of "unconventionally" paired frequencies for its feeder links has been anything but arbitrary: the rationale for the selection is set forth in Appendix 3 hereto. Most important, the selected pairing has given Motorola crucial flexibility in international coordination and has frequently been one of the decisive factors making coordination possible. Motorola has recently conducted informal discussions regarding the space segment coordination of its feeder links with the Italian ITALSAT and Japanese NStar systems. These coordination activities were greatly facilitated by the independently assigned and unconventionally paired frequencies incorporated in the IRIDIUM® system.

### 3. Even Absent the "Unconventional" Pairing of the IRIDIUM® Feeder Links, Unconventional Pairing for GSO FSS Might Still Be Necessary

The conventional downlink pairing for the proposed GSO/FSS allocation at 28.35-28.6 GHz is 18.55-18.8 GHz. International Footnote 872 urges administrations making assignments to the FSS to limit, as far as practicable, the power flux-density at the Earth's surface in the 18.6-18.8 GHz band in order to reduce the risk of interference to passive sensors in the earth-exploration-satellite and space research services. U.S. Footnote 255 provides further that, in the 18.6-18.8 GHz band, the FSS shall be limited to a power flux density at the Earth's surface of -101 dbW/$m^2$ in a 200 MHz band for all angles of arrival. It is not at all clear whether GSO/FSS systems will

be able to meet this limit. For example, Hughes has expressed concern about the "restrictive power limits at 18.6-18.8 GHz."[19/] It may be necessary to address this problem by using an unconventional pairing for the 28.35-28.6 GHz band. For example, some of the 17.7-18.55 GHz band, which would otherwise be orphaned by the LMDS allocation at 27.5-28.35 GHz, could be used for this purpose. Thus, unconventional pairing for the GSO FSS systems may well be required irrespective of Motorola's selection of feeder link spectrum.

### E. The Allocation to MSS Feeder Links in the 20/30 GHz Bands Contemplates Only 1-3 GHz MSS Systems

Motorola believes that the clear intent underlying the proposed band segmentation plan is that the Ka-band feeder link spectrum should be allocated only to MSS systems that will operate in the 1-3 GHz bands and not to any other MSS systems. The Commission has consistently acknowledged that the feeder link allocation in the Ka-band is intended to accommodate the requirements of Non-GSO MSS systems in the 1-3 GHz band, and that it is critically needed precisely for that purpose. See, e.g., Preparation for International Telecommunication Union Radiocommunication Conferences, IC Docket No. 94-31, Report (rel. June 15, 1995), ¶ 46 n. 82 (explaining that the estimated need for 200-500 MHz of Non-GSO MSS feeder link spectrum in the Ka-band "would likely just satisfy requirements for 1.6/2.4 GHz NGSO MSS systems," and that "[a]dditional systems would increase spectrum requirements"); Second Notice of Inquiry, 10 FCC Rcd. 4169, 4192 and n. 77 (rel. Jan. 31, 1995) (setting forth the estimated feeder link requirements for "First Generation NGSO MSS Systems in the 1-3 GHz Band." including a total of 200-500 MHz in the 16-30 GHz band). The Commission should confirm this intention in this rulemaking.

---

19/ See attachment to ex parte letter dated July 6, 1995 to William F. Caton, Acting Secretary, FCC, from John Janka, Counsel for Hughes Communications Galaxy, Inc.

### F. The Commission Correctly Proposes Not to Auction the Big LEO MSS Feeder Link Spectrum

Motorola strongly supports the Commission's proposal not to use competitive bidding with respect to feeder link spectrum.[20/] As the Commission correctly points out in the NPRM:

> auctioning intermediate links could significantly delay the development and rapid deployment of new technologies, products and services for the benefit of the public, ... auctions for these links could impose significant administrative costs on licensees and the Commission, and ... it [is] unclear whether competitive bidding for intermediate links [will] recover for the public a significant portion of the value of the spectrum prevent unjust enrichment or promote efficient and intensive use of the spectrum.[21/]

It was for these reasons that the Commission, in its decision implementing § 309(j) (the competitive bidding provision of the Communications Act), concluded: "Therefore, intermediate links, including MSS feederlinks will not be subject to competitive bidding."[22/] Motorola concurs with this reasoning, and commends the Commission for its decision not to auction spectrum that, as the Commission itself recognizes, is so vitally important to NGSO MSS systems.[23/]

### G. The Need to Implement the Proposed Band Segmentation Plan Makes Waiver of RR 2613 at WRC-95 All the More Imperative

The NPRM correctly notes that a failure by WRC-95 to adopt provisions consistent with the United States' recommended proposals for WRC-95 (especially the waiver of RR 2613 in the 400 MHz of Ka-band uplink and downlink spectrum for

---

20/ NPRM ¶ 146.

21/ Id.

22/ In the Matter of Implementation of § 309(j) of the Communications Act -- Competitive Bidding, 9 FCC Rcd. 2348, 2356 (1994).

23/ NPRM ¶ 146.